Post-fill dive on the Northern Depression (Milwaukee Dock Restoration)

PNNL researchers conducted a dive on the northern depression on February 9 after the completion of fill operations. The divers were able to cover a good portion of the area on a number of crossing legs (see diagram), had good visibility throught the dive, and were able to document the bottom with video. This is intended as a quick summary of the dive with some visuals to help others see the end results of the fill. The full video will be made available is poosible. For reference in the diagram below, the dive started on the southern end of the northern depression near point D-1. The arrows then show the approximate pth the divers took during the dive.

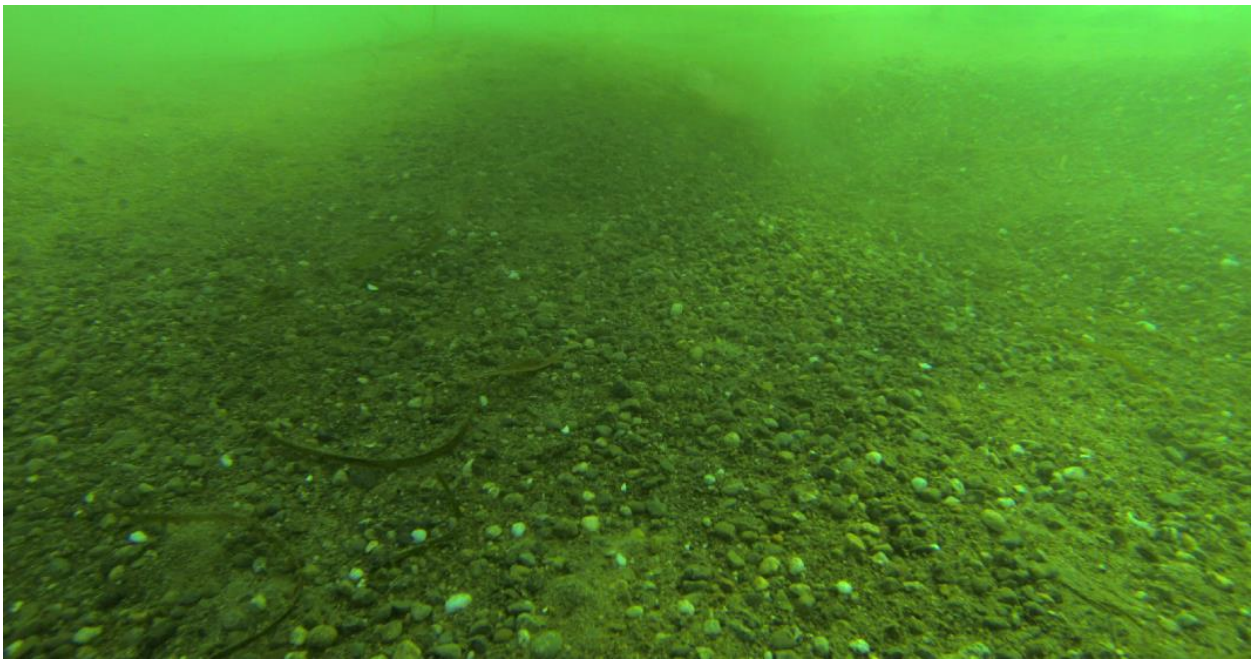
The following paragraph is an exerpt from the email sent to NOAA and the US Army Corps of Engineers after the dive and provides a general description of what the researchers found. After this exerpt are photos grabbed from the video with a short explanation under the photo.

"For the most part I think the contractor did a relatively good job over the majority of the site given they could not see the bottom directly and they had a +/- 1' variance in the scope of work. There were a couple of places that were definitely not what I expected. In some areas the sediment was very coarse - what I am assuming was used as the base layer - and probably too coarse for the eelgrass. We came down in such a spot …, but we realized this coarser sediment appeared to be more along the offshore edge of the depression, which is understandable. There were some intrusions of more coarse material in a couple of other spots, but they were much smaller in scale (and easier to determine with divers). The more troubling problem from the eelgrass standpoint is the irregularity of the bottom. In some places, especially around the edges, there are some substantial undulations or pits in the sediment that will trap drift algae. In fact, some of these depressions have already trapped small amounts of algae and we know the work was very recently completed. To be honest though, most of these depressions

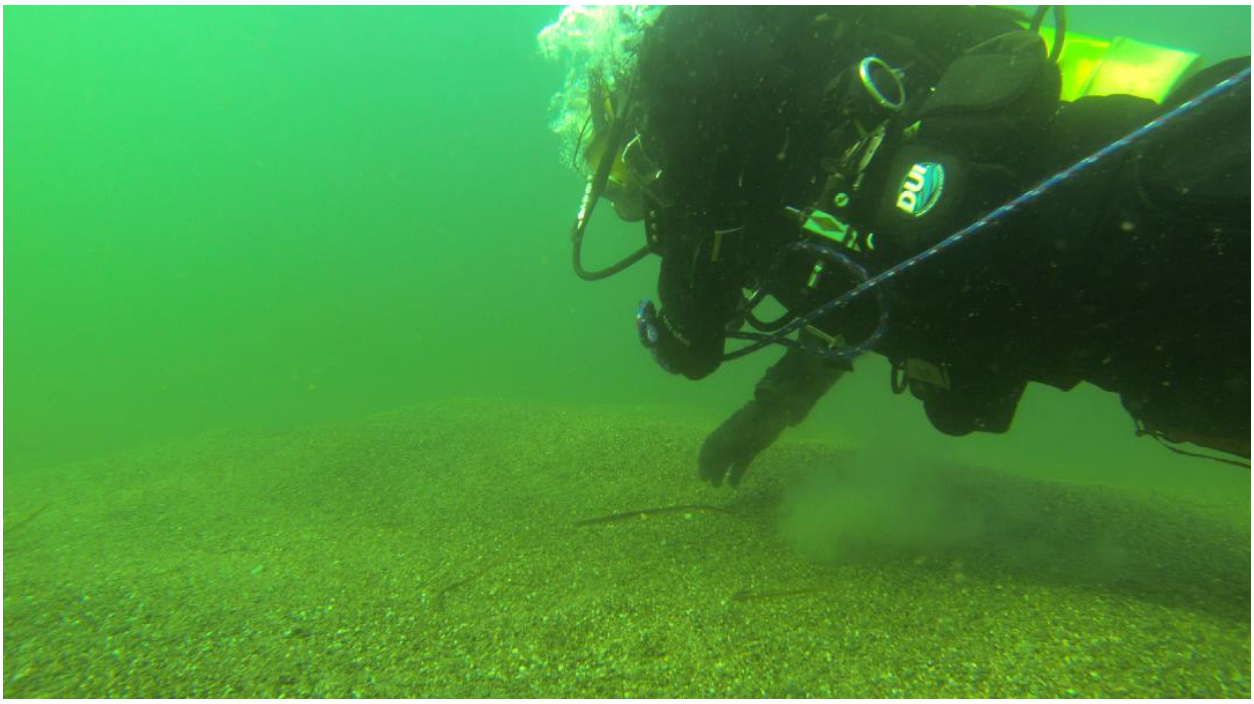
were probably within the tolerance of the SOW if +/- 1' is a 2' window (i.e., 7' to 9' …). I would say in general the variability in depth was no more than 3' for most of the area, but a lot of the variability was over short distances. This leads to steeper sides on the depressions and are more likely to trap the drift algae than longer undulations (picture steep choppy waves versus long ocean swells). To get the smoothness I could like would apparently require dragging something around to "grade" the bottom. Having said all this, much of the middle part of the depression is better. The sediment is much more consistent and the topography is not a severe. If the intent is to increase eelgrass in the area, much of the site can probably be used. The marginal areas will hopefully be moderated by the energy in the Sound.

I would also note, and this is not surprising if we had just enough sediment, that much of the depth seemed to be -8' to -10' by our tide correction and the dive computers. This is not incredibly precise as the resolution on the computer is to the whole foot and why I say they are probably within tolerance in most places. But we were diving at a +3' tide and our dive computers were predominant reading 11 to 13', deeper in a couple of holes and along the outer edge."

Photos

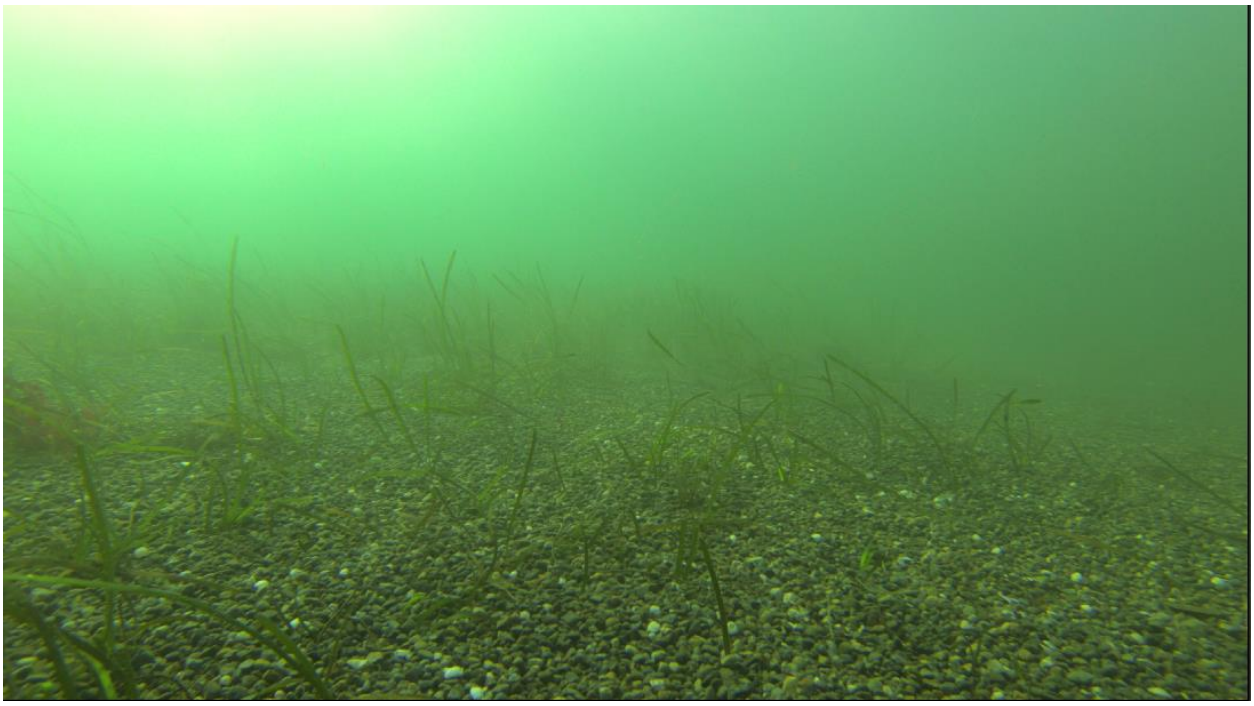


The coarse sediment toward the outer edge of the filled site (southern eastern end)

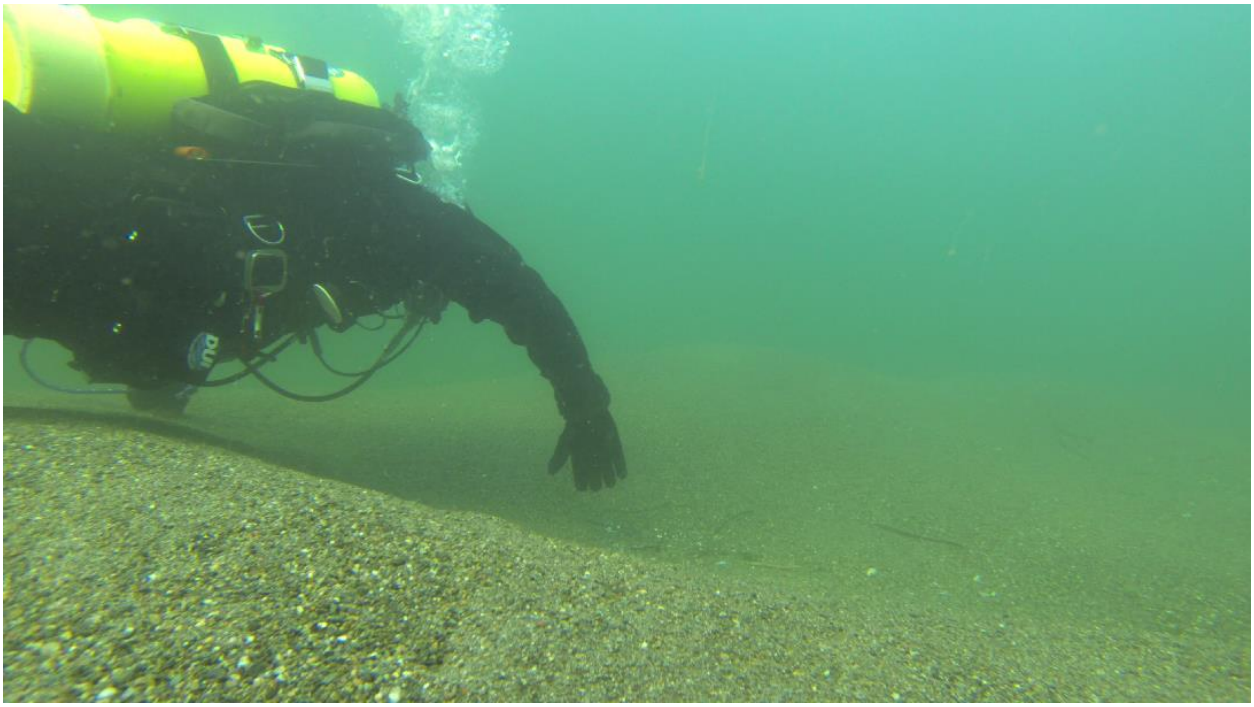


Some of the small mounded topography along the southern edge along the eelgrass between the two depressions. Notice the sediment grain size is finer than in the first photo.

More very coarse material along the southern edge. This was shallower and not associated with the drop-off to the channel on the offshore side of the depression.



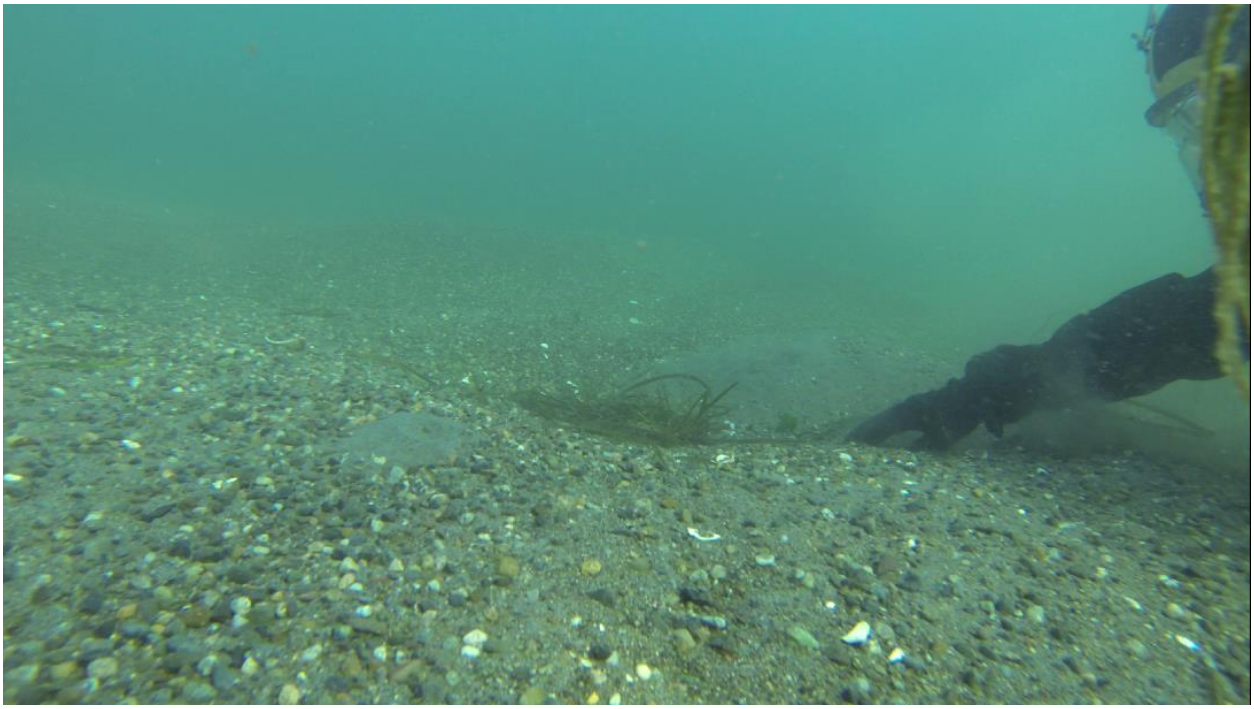
Coarse material on the southern edge of the depression that obviously spilled into the existing eelgrass. Luckily this was not the case for most of the perimeter, but suggests placement of the base layer may have been wider than finer capping material at this location.



Some of the topography in the south eastern corner of the depression. Not sure if these depressions will catch drift algae.

More of the undulating topography. Notice how close the sand “waves “ are – this can lead to more trapping of drift algae than really long period undulations.

Starting leg 3 back to the east. Notice the finer sediment in the foreground and left, with more coarse grains to the right. Also shown is some drift eelgrass, algae, and woody debris (probably not trapped at the locations though).

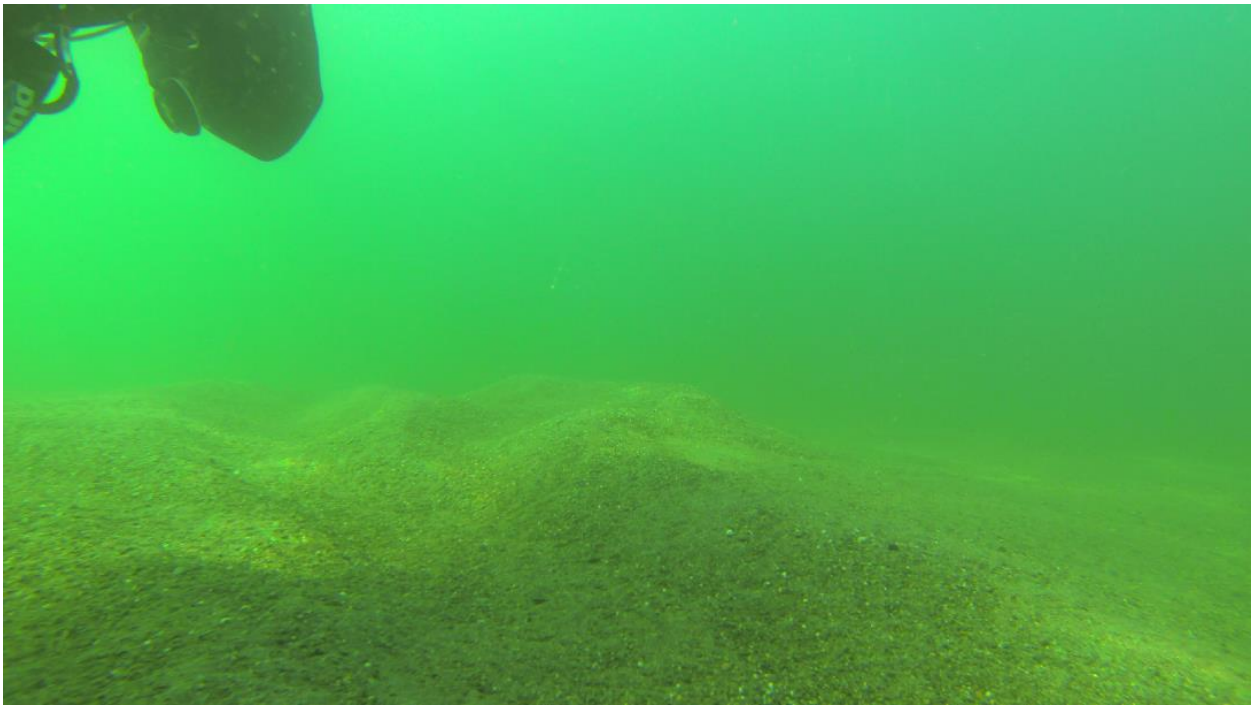


This irregularity is relatively small but probably would trap drift algae. The change in the sediment type is curious on the mound by the diver's hand.

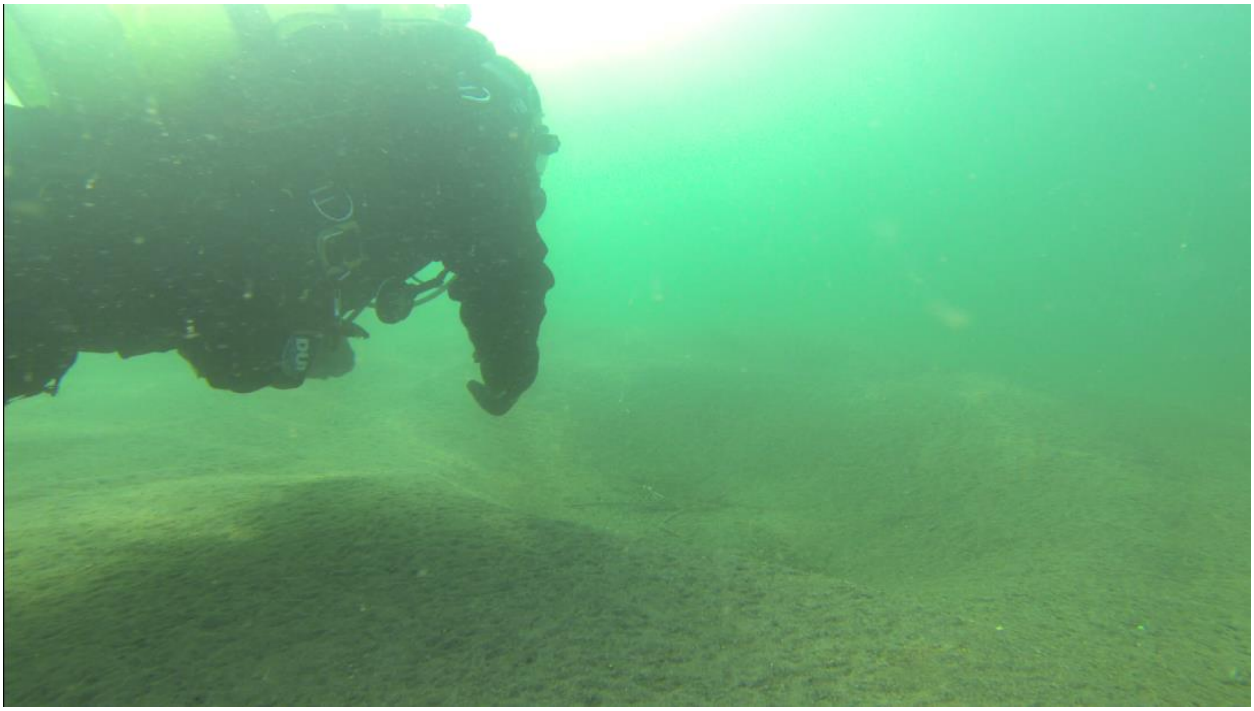
Transition from coarse to more fine sediment. The substrate on the left is better for eelgrass so long as it stays thick enough (this layer was thicker toward the center of the depression).

There are stretches of bottom that are relatively flat and finer sediment (this is approaching the eastern edge of the site on leg 3).

Moving toward the center of the depression on leg 4. The undulations are smaller but ubiquitous and the sediment is a better size.



Many of the irregularities are small laterally and would be difficult to visualize from the surface and difficult to go back afterward and find to fix. These may certainly trap algae, but hopefully storms and longshore drift will help to smooth out over time.

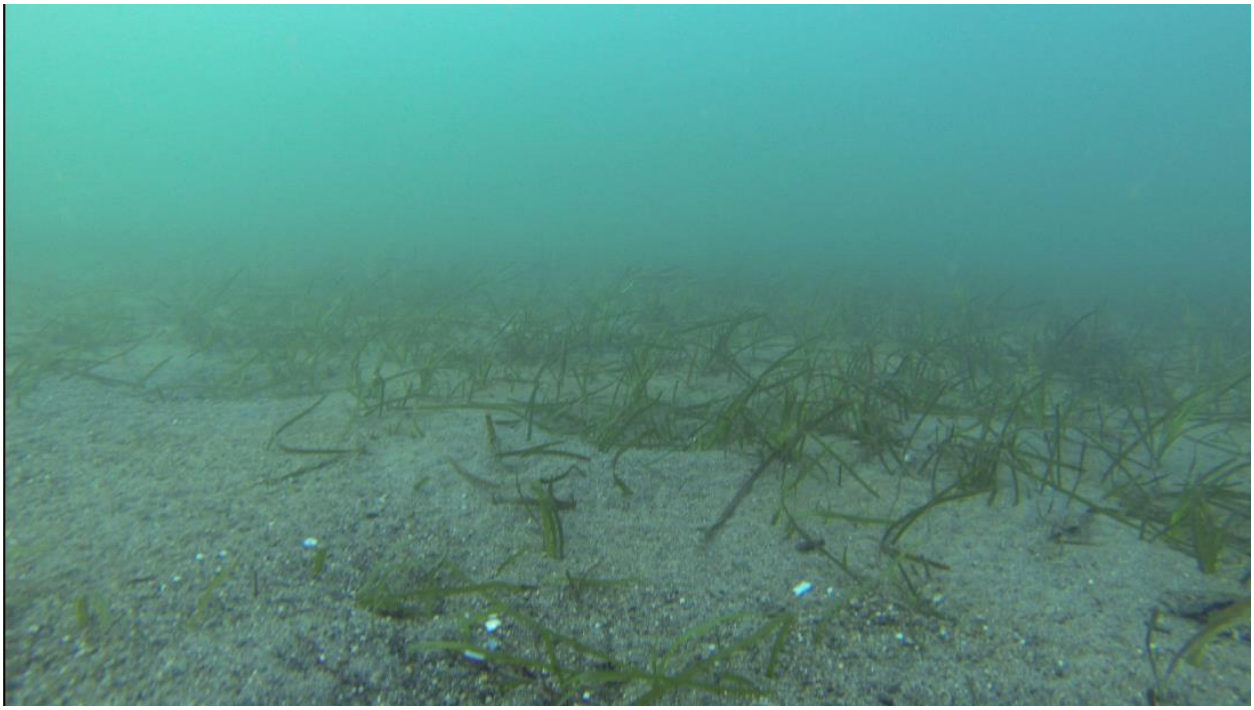


These types of pit will certainly trap drift algae and become depositional areas.

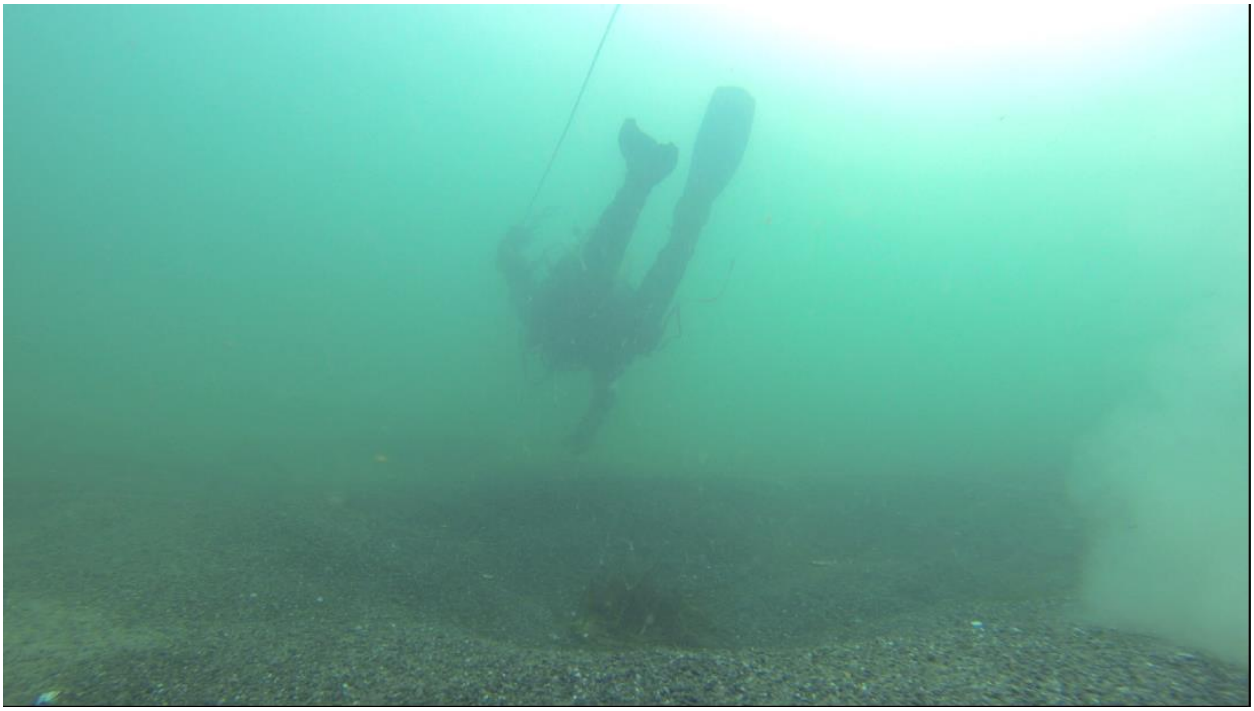
In many areas the undulations were small enough that they should not pose a problem for eelgrass, especially toward the center of the depression.

Odd location toward the end of leg 4 (toward the NW corner of the depression) that had very irregular topography and mounds with different sediments. Notice it is coarse on the right mound, very fine with high clay content in the middle, and closer to normal cap on the left.

Another view of the irregular mounds. I am not sure where all the shell came from in this section.



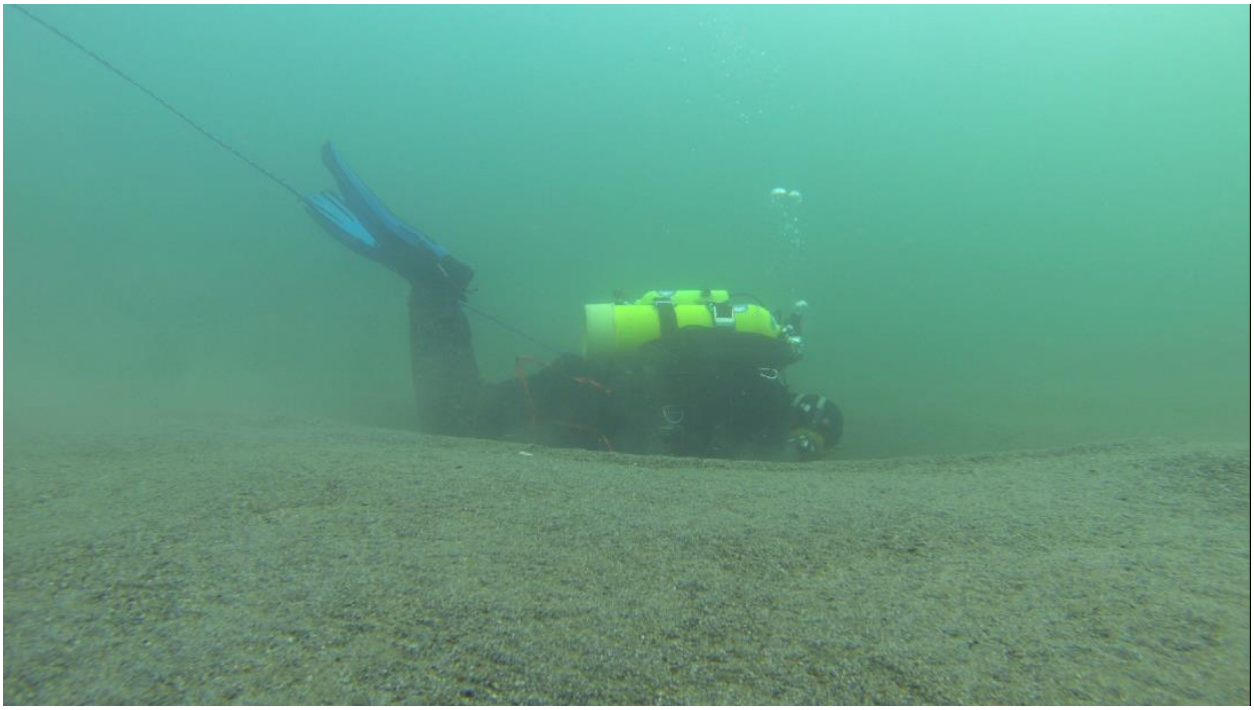
The northern edge and surrounding eelgrass. Any sediment that intruded here into the eelgrass appears to be finer and the layer is thinner. The grass seems to be handling it well.



Shot of the inshore (western) edge with some more depressions and undulations. This small pit has already trapped some drift vegetation.

Nice flat stretch along the east side. You can still see some of the tool marks from the machinery.

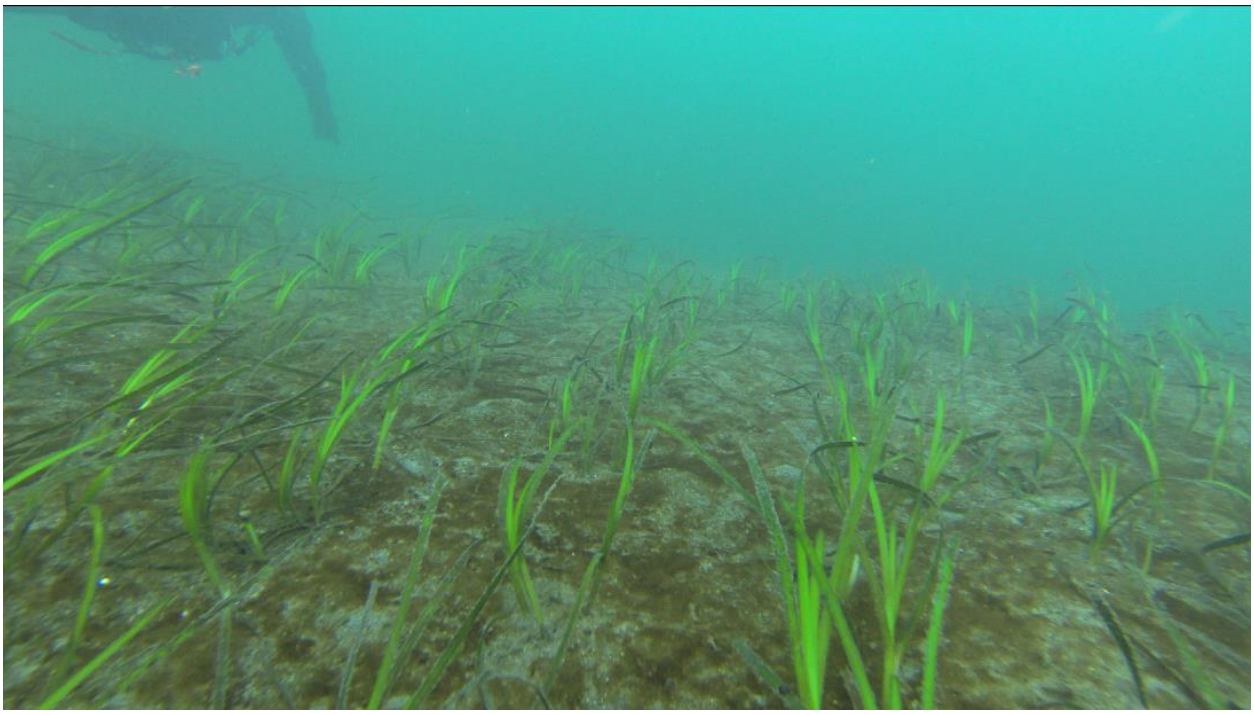
More irregular topography / mounding.



Big crater in a relatively flat area as we approached the eastern edge of the depression.

Even parts of the offshore edge could be relatively flat in stretches.

Some of these undulations on the offshore edge could be over a foot or two high.



Eelgrass from the northern depression planted in the southern depression and looking very good from its winter condition.